

REMARKS

Claims 1, 11 and 12 have been amended, claim 12 has been withdrawn from consideration. Claims 1, 2, 4, 5, 7 and 11-13 are pending. No new matter is presented in this Amendment. Claims 1, 11, 12 and 13 are the independent claims.

ELECTION/RESTRICTION:

In the Office Action, claims 1, 2, 4, 5, 7, 11, 12 and 13, have been restricted into two groups. Group I, drawn to a display device, including claims 1, 2, 4, 5, 7, 11 and 12 and Group II drawn to a method of forming the display device, including claim 13. The Office Action states that since an action on the merits for the originally present claims 1-12 has already been presented, claim 13 has been withdrawn from consideration as being directed to a non-elected invention.

Applicants respectfully traverse this requirement for at least the following reason. Elected claims 1, 2, 4, 5, 7, 11 and 12 are drawn to a display device while claim 13 is drawn to a method of forming the display device.

There have been no references cited to show any necessity for requiring restriction and, in fact, it is believed that the Examiner would find references containing both method and device claims in the same field of technology. Therefore, it is believed, that evaluation of both sets of claims would not provide an undue burden upon the Examiner at this time in comparison with the additional expense and delay to Applicants in having to protect the additional subject matter recited in claim 13 by filing a divisional application.

MPEP §803 sets forth the criteria for restriction between patentably distinct inventions. (A) indicates that the inventions must be independent (see MPEP §802.01, §806.04, §808.01) or distinct as claimed (see MPEP §806.05-806.05(i)); and (B) indicates that there must be a serious burden on the Examiner if restriction is required (see MPEP §803.02, §806.04(a)- §806.04(i), §808.01(a) and §808.02). In the instant case, it is respectfully submitted that the Examiner has not set forth why there would be a serious burden if restriction is required.

REJECTIONS UNDER 35 U.S.C. §102:

Claims 1-2, 5, 7 & 11-12 are rejected under 35 U.S.C. §102(b) as being anticipated by

Mitanaga et al. (U.S. Patent No. 5,923,997).

Applicants respectfully traverse this rejection for at least the following reason.

Regarding the rejection of independent claim 1, it is noted that claim 1 recites a display device with a polysilicon substrate, comprising: a display region; a driving region; a first plurality of thin film transistors in the display region; a second plurality of thin film transistors in the driving region; primary crystal grain boundaries in the polysilicon substrate in the display region and in the driving region; secondary crystal grain boundaries in the polysilicon substrate in the display region and in the driving region; wherein the primary crystal grain boundaries are inclined to a first direction of current flowing from source to drain of each of the first plurality of thin film transistors in the display region at an angle of -30° to 30° and the secondary crystal grain boundaries are inclined to a second direction of current flowing from source to drain of each of the first plurality of thin film transistors in the display region, and wherein the primary crystal grain boundaries are inclined to the second direction of current flowing from source to drain of each of the second plurality of thin film transistors in the driving region at an angle of 30° to 150° and the secondary crystal grain boundaries are inclined to the first direction of the current flowing from source to drain of each of the second plurality of thin film transistors in the driving region.

The Office Action relies on Mitanaga for a teaching of the primary crystal grain boundaries being inclined to a first direction of current flowing from source to drain of each of the first plurality of thin film transistors in the display region at an angle of -30° to 30° and the secondary crystal grain boundaries being inclined to a second direction of current flowing from source to drain of each of the first plurality of thin film transistors in the display region.

However, Mitanaga discloses that in an LCD device, the TFTs prepared in the display portion for switching each pixel need not to have a so high mobility but it is necessary to minimize a leak current, i.e., the current when the TFT is in its off state. For this reason, the direction of the source and drain regions are designed such that the current crosses grain boundaries formed within the channel regions of the TFT. Therefore, the direction in which the crystallization proceeds is perpendicular to the current flow direction in the TFT (FIG. 5C, column 15, lines 33-44). In other words, Mitanaga teaches primary crystal grain boundaries perpendicular to the direction of the current flowing from the source to the drain in the display portion.

Contrary to Mitanaga, independent claim 1 recites that the primary crystal grain

boundaries are inclined to a first direction of current flowing from source to drain of each of the first plurality of thin film transistors at an angle of -30° to 30° . In other words, the primary crystal grain boundaries are substantially parallel to the direction of the current flowing from the source to the drain in the display region, and not perpendicular as taught by Mitnaga (FIG. 5C, column 15, lines 33-44).

Furthermore, as noted above, independent claim 1 recites the inclination of the primary crystal grain boundaries in the display region and in particular states that the primary crystal grain boundaries are inclined to a first direction of current flowing from source to drain of each of the first plurality of thin film transistors in the display region.

Mitnaga however, discloses a relationship between a direction of current flow and a grain boundary in a peripheral circuit portion.

Referring to column 7, lines 59-67 and column 8, lines 1-16, Mitnaga discloses that the TFT must have a relatively low mobility in order to obtain a good off current in the display region and must have a relatively high mobility in the peripheral circuit portion. Also, referring to column 14, lines 48-67 and column 17, lines 1-46, particularly referring to column 14, lines 53-55, Mitnaga discloses that "the carriers move in a direction parallel with the crystal grain boundaries, thereby obtaining the TFT having a high mobility of the carriers."

Accordingly, the location where the current moves in a direction parallel with the crystal grain boundaries, in order to obtain a high mobility, is in the peripheral region, and not in the display region, as recited in independent claim 1.

The reason for this type of mobility, is that there are primary and secondary grain boundaries, formed by an SLS method, as recited in the claims, while there is only one kind of grain boundary in Mitnaga.

Therefore, since Mitnaga fails to disclose the relationship between a direction of current flow and a grain boundary in the display portion, and discloses only a relationship between a direction of current flow and a grain boundary in the peripheral circuit portion, Mitnaga fails to teach or suggest the novel features of independent claim 1.

Accordingly, Applicants respectfully assert that the rejection of claim 1 under 35 U.S.C. § 102(b) should be withdrawn because Mitnaga fails to teach or suggest each feature of independent claim 1.

Regarding the rejections of independent claims 11 and 12, it is noted that these claims recite some substantially similar features as claim 1. Thus, the rejections of these claims are also traversed for the reasons set forth above.

Furthermore, Applicants respectfully assert that the rejection of dependent claims 2, 5 and 7 under 35 U.S.C. §102(b) should be withdrawn at least because of their dependence from claim 1 and the reasons set forth above, and because the dependent claims include additional features which are not taught or suggested by the prior art. Therefore, it is respectfully submitted that claims 2, 5 and 7 also distinguish over the prior art.

REJECTIONS UNDER 35 U.S.C. §103:

Claim 4 is rejected under 35 U.S.C. §103(a) as being unpatentable over Mitnaga et al. (U.S. Patent No. 5,923,997).

Applicants respectfully traverse this rejection for at least the following reason.

Initially it is noted that claim 4 depends from claim 1 and as noted above, Mitnaga fails to teach or suggest the novel features of independent claim 1.

Accordingly, Applicants respectfully assert that the rejection of dependent claim 4 under 35 U.S.C. §103(a) should be withdrawn at least because of its dependency from claim 1, and because the dependent claim includes additional features which are not taught or suggested by the prior art. Therefore, it is respectfully submitted that claim 4 also distinguishes over the prior art.

CONCLUSION:

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 503333.

Respectfully submitted,

STEIN, MCEWEN & BUI, LLP

Date: 4/11/08

By: Douglas X. Rodriguez
Douglas X. Rodriguez
Registration No. 47,269

1400 Eye St., NW
Suite 300
Washington, D.C. 20005
Telephone: (202) 216-9505
Facsimile: (202) 216-9510